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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/674,675	09/29/2003	Zhisong Huang	LAM1P168X1/P1164X	5003

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EXAMINER	
DEO, DUY VU NGUYEN	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 06/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/674,675	HUANG ET AL.	
	Examiner	Art Unit	
	DuyVu n. Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *15-19* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/1/04, 3/29/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

IDS considered: 2/17/04, 2/3/05, 10/12/04

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-8, 11, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (US 6,617,253) and admitted prior art.

Chu describes an oxide etching method comprising: forming a polymer layer on exposed surfaces of the photoresist mask (claimed trench mask) and vertical sidewalls of the feature with a passivation gas mixture (table 1; col. 3, line 60-65; col. 10, line 26-39; figure 15); etching the feature (claimed trench) through the etching mask with reactive etching mixture containing at least one etching chemical; removing the photoresist (col. 3, line 60-65; col. 9, line 61-65; col. 11, line 8-35). Unlike claimed invention, Chu doesn't describe forming vias in the etch layer. Admitted prior art in the specification teaches a method for forming contact hole having the step of forming vias in the etch layer (page 5, 6; fig. 10). It would have been obvious for one skilled in the art to modify Chu in light of the admitted prior art because it teaches further steps in forming contact hole such as dual damascene structure. The modification would provide claimed invention with a reasonable expectation of success.

Referring to claims 2, 3, Chu shows the passivation and etching step can be repeated one or more times (col. 11, line 38-42; col. 15, line 62-67).

Referring to claim 4, Chu shows the passivation and etching are performed in a common plasma-processing chamber (col. 6, line 15-65).

Referring to claims 5, 7, Chu teaches that the bias power during the passivation step is 0 or at a range where polymer deposition is more predominant than accelerated plasma etching of the dielectric film (col. 6, line 38-40, line 66-col. 7, line 10). Since the gases are not accelerated toward the substrate because of low or no bias power, this would read on claimed non-directional deposition (CVD, non-etching or negligibly etching deposition) and directional etching.

Referring to claim 6, Chu shows the power supplied for the passivation step is 1700-3300W and for the etching step is source power at 2000-3000W and bias power at 1000-1500W. This would provide ion bombardment energy, in the passivation step, of greater than 100 electron volts.

Referring to claim 8, Chu teaches the polymer chemical (deposition gas) includes, CH3F, C2H2, CH4, CH2F2, and Ar (col. 3, line 60-65; col. 9, line 1-12; col. 10, line 37-39) and the etching gas comprises of CF4, C2F6 (col. 13, line 12-17).

Referring to claim 13, Chu doesn't show a sacrificial filler material in the via holes prior to the start of the trench plasma etching process.

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chu and admitted prior art as applied to claim 1 above, and further in view of Tang et al. (US 6,211,092).

Referring to claim 12, Chu is silent about the etch layer is a low-k dielectric layer. Tang teaches a same method of forming contact hole wherein he uses etch layer including oxide, and low-k dielectric layer (col. 1, line 30-37; col. 14, 42-50). It would have been obvious for one

skilled in the art to use layer including low-k dielectric layer to form a dual damascene structure since it is desired to used a low-k dielectric layer as inter-level dielectric layer as taught by Tang (col. 1, line 30-37).

4. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu and admitted prior art as applied to claim 1 above, and further in view of Bhardwaj et al. (US 6,051,503).

Referring to claim 9, applied prior art above doesn't suggest the deposition gas including H2. However, using H2 with the deposition gas is well known to one skilled in the art at the time of the invention as shown here by Bhardwaj (col. 5, line 33). Therefore, it would have been obvious for one skilled in the art to use H2 with the deposition gas because Bhardwaj suggests that it is used to dilute the deposition gas (col. 3, line 33).

The gas flow rate would be a result-effective variable and must be determined through routine experimentation in order to provide optimum gas flow rate for the deposition of the protective layer with a reasonable expectation of success.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chu and admitted prior art as applied to claim 1 above, and further in view of Hussein et al. (US 6,406,995).

Unlike claimed invention, applied prior art above doesn't describe he via holes are filled with a filler material to no more than 50% of the via hole height prior to the start of the trench etching process. Hussein teaches a method for forming dual damascene structure wherein the via hole is filled with a material to about 50% prior to the start of the trench etching process (fig. 6; col. 5, line 15-48). It would have been obvious for one skilled in the art at the time of the invention to modify the above prior art in light of Hussein because he teaches that filling the via

with this material would protect the underlying interconnections during the trench etching process (col. 3, line 1-13).

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 1-14 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3-16, 19 of copending Application No. 10/411,520 in view of admitted prior art. They both teaching a method for etching a contact hole in a layer including steps of forming a protective layer with a deposition gas and etching the feature with polymer former and etch enabler gases. Even though the claims of patent '520 do not suggest forming vias in the etch layer. However, forming a vias would be obvious, in light of admitted prior art (pages 5, 6 of the specification), as practiced by one skilled in the art at the time of the invention in order to form a dual damascene structure.

This is a provisional obviousness-type double patenting rejection.

8. Claims 1-14 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 6833,325 in view of admitted prior art. Claims 1-20 of patent '325 teaches teaching a method for etching a feature in a layer including steps of forming a protective layer with a deposition gas and etching the contact hole with polymer former and etch enabler gases. Even though the claims of patent '325 do not suggest forming vias in the etch layer. However, forming a vias would be obvious, in light of admitted prior art (pages 5, 6 of the specification), as practiced by one skilled in the art at the time of the invention in order to form a dual damascene structure.

Election/Restrictions

9. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-14, drawn to a method, classified in class 438, subclass 689.

II. Claims 15, drawn to a product, classified in class 257, subclass 499.

III. Claims 16-19, drawn to an apparatus, classified in class 156, subclass 345.1.

The inventions are distinct, each from the other because of the following reasons:

10. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the method can be used to make another and materially different process such as making a contact hole for a capacitor.

11. Inventions I and III are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used for another and materially different process such as depositing process only.

12. Inventions II and III are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case the apparatus can be used to etch a non-semiconductor device.

13. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

14. Because these inventions are distinct for the reasons given above and the search required for one group, is not required for other group, restriction for examination purposes as indicated is proper.

15. During a telephone conversation with Michael Lee on 6/15/05 a provisional election was made with traverse to prosecute the invention of the method, claims 1-14. Affirmation of this election must be made by applicant in replying to this Office action. Claims 15-19 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

16. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-3:30; with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Primary Examiner
Duy-Vu N. Deo
6/21/05